Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
Biennial Review	)	ET Docket No. 08-180
	)	WT Docket No. 08-182
	)	

PROPOSALS OF MARCUS SPECTRUM SOLUTIONS, LLC

Marcus Spectrum Solutions, LLC ("MSS") hereby presents proposals for the Commission's Biennial Review process. The suggestions herein deal with anachronisms in the Commission's technical rules that exist because of the rapid technological change in the last two decades. "Quick fix" solutions have been made to the technical rules to meet the needs of firms wanting to introduce new products and services and to "patch up" interference problems that have occurred. But in the rush to make these urgent repairs, more fundamental problems have been overlooked out of necessity. MSS believes that the biennial review process is a good time to identify these anachronisms and prioritize them for resolution as time and resources are available. Indeed, just having a list of pending problems will allow some of them to be included in related rulemakings at little additional effort for the Commission staff and the public.

The two basic issued addressed below are emission standards for radio receivers and the need to remove ambiguities in the rules about emission standards with respect to the resolution bandwidths they are defined over.

I. RECEIVER EMISSION REGULATION

The Commission has jurisdiction under §302 of the Communications Act of 1934, as amended, to

> "make reasonable regulations governing the interference potential of devices which in their operation are capable of emitting radio frequency energy by radiation, conduction, or other means in sufficient degree to cause harmful interference to radio communications"

The Commission has interpreted this to include the unintentional emissions of radio receivers and has regulated them in §15.101(a) of its Rules. However, §15.101(b) limits this regulation to only "those receivers that operate (tune) within the frequency range of 30-960 MHz, CB receivers and radar detectors". No doubt, at the time the basic framework of §15.101(b) was adopted 960 MHz seemed like a very high frequency and

that low cost, mass produced consumer equipment would never be available at such high frequencies. Also when this rule was adopted there were no receivers in residential environments, or even in most office environments, that received signals about 960 MHz. Indeed, use of higher frequencies was generally only by common carriers and radar systems that both used expensive equipment made by top tier manufacturers.

However, a visit to Walmart, Radio Shack, Circuit City, etc. will quickly confirm a wide variety of consumer electronics that works above 960 MHz and receivers that could have unintentional emissions in these band are presently subject to absolutely no limitations on receiver emissions. Consumer electronics above 960 MHz now include PCS, AWS, SDARS, BRS, ISM band unlicensed systems such as Wi-Fi and Bluetooth, and DBS. Many of these systems are normally included with transmitters in the same unit and hence the receivers are implicitly subject to regulations. But this is not a requirement and some future units might be package differently.

However, the lessons of Docket 01-278 here are important. This proceeding added the above phrase "radar detectors" to §15.101(b) in response to complaints from the VSAT industry that police radar detectors were causing interference to VSAT receivers. While the Docket 01-278 NPRM states

> "More recently, however, we have received a number of reports of interference caused to very small aperture satellite terminals (VSATs) by mobile receivers designed to detect the presence of police radar ('radar detectors')" (emphasis added)

in reality VSAT interference complaints traceable to radar detectors had existed for more than a decade and the Canadian Government even had raised concerns to the Commission over this issue several years earlier in routine bilateral information exchanges.

The Commission turned a deaf ear to multiple informal complaints year after year until the complaints reaches a crescendo that could no longer be ignored.[1] Thus while the Commission did solve the particular problem at hand by regulating radar detector emissions in Docket 01-278, there was considerable inertia in the process and there are serious questions as to whether this is a good precedent for dealing with future emission problems. Note that since the present rules have no limits at all on receiver emissions, the emergence of a new product with emission interfering with other services gives the Commission few options: It could ask each user of the device to cease under the provisions of §15.5(c) but it could not stop the sale of the products without another rulemaking analogous to Docket 01-278.

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[1] It is particularly ironic that the source of interference here was not an innocuous productive product such as a baby monitor, but rather a device intended to facilitate illegal activity and which is banned in several states. One wonders how much longer the Commission might have waited to act if the device in question was more socially acceptable.

Those of us who worked for Richard Smith[2], former Chief of the Field Operations Bureau (predecessor of the Enforcement Bureau) will recall his stories of one of his first assignments in the Commission's Los Angeles field office: Prior to the present §15.101(b) an early generation of garage door opener receivers had high emissions in a band used by Navy aircraft. Mr. Smith and his colleagues had to fly all over the Los Angeles area in Navy helicopters to identify the receivers and demand shutdown pursuant to the version of §15.5(c) in place at that time. Mr. Smith concluded that the best way to deal with such interference problems was to prevent them rather than trying to find consumer products once they have left the retailer. He routinely shared this story with his staff.

The general issue of regulating receivers above 960 MHz was raised in the comments in Docket 01-278. The Report and Order says,

> Uniden America Corporation (Uniden), Shure, Inc. (Shure) and Cisco Systems, Inc. (Cisco) support the adoption of radiated emission limits on all receivers that operate above 960 MHz. Uniden states that singling out radar detectors as the only receiver subject to emission limits merely addresses one potential interference problem without addressing future issues. It states that the adoption of a universal emission standard for all unlicensed devices operating above 960 MHz is more equitable and more likely to promote innovation by manufacturers because it will provide certainty by setting forth a definitive technical standard. Shure states that because there are now more receivers operating above 960 MHz than in the past, the Commission should impose radiated emission limits on all types of unintentional adiators, as well as receivers such as radar detectors. Cisco believes that cheap receivers with high levels of radiated emissions could cause interference with high-tech transceivers used in bands above 1000 MHz.[3]

Yet the R&O dismissed these concerns and focused on the narrow issue of radar detector emissions:

> There is not sufficient information in the record in this proceeding to justify emission limits for receivers above 960 MHz other than radar detectors. We are adopting emission limits for radar detectors because they have been found to emit high level signals that can cause interference to VSATs. No information was provided to show that similar circumstances exist with other receivers operating above 960 MHz. Therefore, we find that requiring other receivers operating above 960 MHz to comply with emission limits is not necessary at this time. This does not preclude our ability to impose such limits in the future if the need becomes apparent.[4]

Since this R&O, consumer grade receivers and services above 960 MHz have continued to proliferate. In addition, the manufacturing of consumer electronics has moved mainly to very competitive overseas manufactures who are very cost conscious. The risk of the retail sale of thousands or hundreds of thousands of receivers with strong emissions in a band used by licensed services has increased significantly. The only tool the

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[2] *See* http://www.fcc.gov/Bureaus/Miscellaneous/News_Releases/1998/nrmc8045.txt

[3] Report and Order, Docket 01-278 at para. 7

[4] *ibid.* at para. 20

Commission has for such an event is the same one Mr. Smith used in Los Angeles in the 1960s – locate every user and demand shutdown pursuant to §15.5(c).

For good reason, the Commission is reluctant to impose new regulatory burdens unless they have clearly balancing public benefits. But the present 960 MHz limit in §15.101(b) are clearly anachronistic. MSS urges the Commission to issue an NPRM to revise this limit upward, considering options that would limit costs to industry and consumers.

One option might be to just have an emission limit that applies above 960 MHz without a formal requirement for notification or verification or declaration of conformity. Thus manufacturers would not be required to have each model tested by an approved laboratory. Almost all receivers have emissions significantly less than the §15.109 limits so a simple test by the manufacturer or his agent could quickly confirm this at little cost. However, under such a regime, the Commission could act quickly to prevent the sale of equipment found to exceed regulatory limits. No doubt there are other options possible to balance costs and benefits here. However, the finding in the Docket 01-278 R&O that the Commission can wait to take action is longer tenable considering current market conditions.

II. OUT-OF-BAND EMISSIONS REGULATIONS

An integral part of the Commission's §302 jurisdiction is to set emission limits for out-of-band emissions ("OOBE") of transmitters. It has done so in numerous parts of its rules. These sections have been written and revised at various times since 1934 and many of them are now inconsistent and ambiguous. MSS suggests a slow and deliberate cleanup here to clarify the rules and remove ambiguities, but **not** to change the specific limits in each service.

In the beginning of OOBE regulation, all transmitters were analog and used modulations such as AM, FM, SSB, etc. If the input to the transmitter was a single audio tone or a pair of tones, such as prescribed in §2.1049, then the output was inevitably a set of discrete spectral lines. OOBE could then be set by measuring each such line and comparing its power to the main transmitter power. (Note that even in the past, a problem of this regulatory approach is that compliance can only be determined under laboratory conditions, not under normal operating conditions.) However, in the past three decades, piecemeal provisions have been added to various service rules at various times to deal with digital modulation where the output is not a spectrum of discrete lines. Digital modulation with arbitrary digital input results in a continuous stochastic spectrum that can be measured unambiguously only if a resolution bandwidth is specified. In different rule parts the resolution bandwidth necessary to make the OOBE limit unambiguous is handled in different ways, sometimes making the rule legally ambiguous – analogous to specifying a speed limit as "55 miles" when "55 miles per hour" was intended.

In addition, OOBE limits are often stated in terms of formulas such as $43 + 10*\text{Log}_{10} P$, e.g. §24.133. Clearly this is intended to mean that the suppression should be 43 dB below the main signal for low power signals and with increasing attenuations for signals with high power. However, such a formulation is ambiguous unless the measurement

resolution bandwidth is stated and it is clear whether P is the total transmitter power or the transmitter power measured in the resolution bandwidth. Note that §24.133(a) clearly states that P is defined in §24.132(f) – which in turn gives a very precise definition. This precision does not exist elsewhere in the Commission's Rules.

Finally, the Commission defines[5] OOBE as

> "Emission on a frequency or frequencies immediately outside the necessary bandwidth which results from the modulation process, but excluding spurious emissions."

It then defines spurious emissions as

> "Emission on a frequency or frequencies which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions."

Presumably, OOBE quantitative limits as in §24.238(a) apply to both types of emissions, but this is not clear in every rule part. Emission limits should clearly state whether they apply to OOBE, spurious emissions or both.

First, we shall give an example of an unambiguous OOBE emission limits. §73.44 deals with AM broadcast stations is probably is one of the oldest parts of the Commission's Rules. As presently codified it states

> **§73.44 AM transmission system emission limitations.**
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> (a) The emissions of stations in the AM service shall be attenuated in accordance with the requirements specified in paragraph (b) of this section. Emissions shall be measured using a properly operated and suitable swept-frequency RF spectrum analyzer using a peak hold duration of 10 minutes, no video filtering, and a 300 Hz resolution bandwidth, except that a wider resolution bandwidth may be employed above 11.5 kHz to detect transient emissions. Alternatively, other specialized receivers or monitors with appropriate characteristics may be used to determine compliance with the provisions of this section, provided that any disputes over measurement accuracy are resolved in favor of measurements obtained by using a calibrated spectrum analyzer adjusted as set forth above.
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> (b) Emissions 10.2 kHz to 20 kHz removed from the carrier must be attenuated at least 25 dB below the unmodulated carrier level, emissions 20 kHz to 30 kHz removed from the carrier must be attenuated at least 35 dB below the unmodulated carrier level, emissions 30 kHz to 60 kHz removed from the carrier must be attenuated at least [5 + 1 dB/kHz] below the unmodulated carrier level, and emissions between 60 kHz and 75 kHz of the carrier frequency must be attenuated at least 65 dB below the

[5] §2.1

> unmodulated carrier level. Emissions removed by more than 75 kHz must be attenuated at least 43 + 10 Log (Power in watts) or 80 dB below the unmodulated carrier level, whichever is the lesser attenuation, except for transmitters having power less than 158 watts, where the attenuation must be at least 65 dB below carrier level.

This section gives both the resolution bandwidth to be used for measurements and an unambiguous statement that P refers to the unmodulated carrier. Note this it is defined in such a way to permit operational measurements since a peak hold time is specified.

§24.133 is also an example of a rule with no ambiguities.

By contrast, §18.305 is also an old rule section, dealing with ISM devices such as microwave ovens. It states,

§ 18.305 Field strength limits.

(a) ISM equipment operating on a frequency specified in §18.301 is permitted unlimited radiated energy in the band specified for that frequency.

(b) The field strength levels of emissions which lie outside the bands specified in §18.301, unless otherwise indicated, shall not exceed the following:

Equipment	Operating frequency	RF Power generated by equipment (watts)	Field strength limit (uV/m)	Distance (meters)
Any type unless otherwise specified (miscellaneous)	Any ISM frequency	Below 500 500 or more	25 25×SQRT(power/500)	300 [1]300
	Any non-ISM frequency	Below 500 500 or more	15 15×SQRT(power/500)	300 [1]300
Industrial heaters and RF stabilized arc welders	On or below 5,725 MHz Above 5,725 MHz	Any Any	10 ([2])	1,600 ([2])
Medical diathermy	Any ISM frequency Any non-ISM frequency	Any Any	25 15	300 300
Ultrasonic	Below 490 kHz	Below 500 500 or more	2,400/F(kHz) 2,400/F(kHz)× SQRT(power/500)	300 [3]300
	490 to 1,600 kHz Above 1,600 kHz	Any Any	24,000/F(kHz) 15	30 30
Induction cooking ranges	Below 90 kHz On or above 90 kHz	Any Any	1,500 300	[4]30 [4]30

[1]Field strength may not exceed 10 μV/m at 1600 meters. Consumer equipment operating below 1000 MHz is not permitted the increase in field strength otherwise permitted here for power over 500 watts.

[2]Reduced to the greatest extent possible.

[3]Field strength may not exceed 10 μV/m at 1600 meters. Consumer equipment is not permitted the increase in field strength otherwise permitted here for over 500 watts.

[4]Induction cooking ranges manufactured prior to February 1, 1980, shall be subject to the field strength limits for miscellaneous ISM equipment.

Note that no indication of resolution bandwidth is given here for the field strength limit. Moving down through the rules, one finds in §18.305 the following,

> **§ 18.311 Methods of measurements.**
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> The measurement techniques which will be used by the FCC to determine compliance with the technical requirements of this part are set out in FCC Measurement Procedure MP–5, "Methods of Measurements of Radio Noise Emissions from ISM equipment". Although the procedures in MP–5 are not mandated, manufacturers are encouraged to follow the same techniques which will be used by the FCC.

In MP-5[6] there is information that 1 MHz resolution bandwidth shall be used for frequencies greater than 1 GHz. However, in view of the §18.311 wording that "the procedures in MP–5 are not mandated" there is an apparent ambiguity as to what measurement bandwidth should be used. Decreasing the measurement bandwidth decreases the apparent field strength so measurement bandwidth is an integral part of the emission limit.

§22.359 is unambiguous with respect to resolution bandwidth, but the wording of §22.359(a) has some ambiguity with respect to the definition of P, unlike the counterpart rules in §§24.132,133.

§24.238 has many parallels to §24.133, however, it lakes a clear definition of how P is defined.

§27.53 is unambiguous with respect to resolution bandwidths, but has some ambiguities with respect to P. (Note that in this section some parts use "p" and some parts use "P" for transmitter power, but in no case clarify how it is determined.

MSS recognizes that Parts 80 and 87 are tied to international standards for interoperability, but the present codified rules have real ambiguities. Presumably the Commission and industry have some understanding as to what the resolution bandwidths to be used here are. These should be codified in the rules or at least noted in foot notes to the rules. §80.211, §80.211(b) clearly states resolution bandwidth, but §80.211(a), §80.211(c)-(f) do not. In §87.139, §87.139(e)-(f) and §87.139(k)-(l) are unambiguous with respect to resolution bandwidth, but the other sections are ambiguous.

In §90.210, §90.210(d)-(e) are unambiguous, due to the details in §90.210(d)(4) and §90.210(e)(4), and §90.210(k)(3), §90.210(l), and §90.210(m) are unambiguous but the remainder of §90.210 contains measurement ambiguities.

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[6] http://www.fcc.gov/Bureaus/Engineering_Technology/Documents/measurement/mp5/mp5-1986.pdf

III. CONCLUSIONS

The issues mentioned here have developed over a long time. While they are not a high priority to correct, it is clear that the legislative intent of the biennial review is to identify problems in the Commission's Rules that result from changes in technology and industry structure and to set them on a path towards updating.

MSS believes that the problems with receiver emission regulation and OOBE regulation are problems that need to be identified and set in a priority system. Once this is done, these changes can be included in other rulemakings that happen to address the rule sections involved. Alternatively, they might be addressed in one or two low priority rulemakings. But if left unaddressed these problems will just continue to fester and become an "accident waiting to happen".

/s/

Michael J. Marcus, Sc.D., F-IEEE
Director
Marcus Spectrum Solutions, LLC

8026 Cypress Grove Lane
Cabin John, MD 20818
301-229-7714
mjmarcus@marcus-spectrum.com
www.marcus-spectrum.com